

CLAIMS

1. A method of detecting failure of a ring network wherein communications are conducted by connecting a plurality of nodes in double loops consisting of a first transmission line and a second transmission line having mutually different transmission directions, and establishing paths on those transmission lines, characterized in that

one of the nodes among the plurality of nodes is established as a central station and other nodes are established as remote stations;

the central station transmits failure monitoring information to respective remote stations using the first transmission line;

the remote stations, upon receiving the failure monitoring information through the first transmission line, loop back and return the received failure monitoring information to the central station using the second transmission line; and

the central station identifies a failed part in the ring network based on whether or not the failure monitoring information looped back at each of the remote stations has been received correctly.

2. The method of detecting failure of a ring network according to claim 1, characterized in that the first transmission line is used as a primary transmission line for communications between the nodes, and the second transmission line is used as a secondary transmission line for communications between the nodes.

3. The method of detecting failure of a ring network according to claim 1, characterized in that the nodes are arranged in a plurality of dispersed sites,

and respectively accommodate one or a plurality of local communication terminals.

4. The method of detecting failure of a ring network according to claim 1, characterized in that the nodes have ATM switches respectively, the failure monitoring information consists of a fixed-length ATM cell, and transmitting and returning of the failure monitoring information are performed by establishing paths through the ATM switches.

5. The method of detecting failure of a ring network according to claim 1, characterized in that the failure monitoring information is transmitted periodically from the central station to the remote stations.

6. The method of detecting failure of a ring network according to claim 1, characterized in that the central station transmits the failure monitoring information using both the first transmission line and the second transmission line, and the remote stations loop back and return the received failure monitoring information back to the central station using the second transmission line when the failure monitoring information has been received from the first transmission line, and loop back and return the received failure monitoring information back to the central station using the first transmission line when the failure monitoring information has been received from the second transmission line.

7. The method of detecting failure of a ring network according to claim 1, characterized in that the remote stations transmit failure monitoring information to a neighboring remote station or to the central station using the

first transmission line or the second transmission line, the neighboring remote station or the central station which has received the failure monitoring information loops back and returns the failure monitoring information to the remote station which has transmitted the failure monitoring information, and the remote station which has transmitted the failure monitoring information detects individual failures based on whether or not that failure monitoring information has been received correctly from the neighboring remote station or the central station.

8. The method of detecting failure of a ring network according to claim 1, characterized in that the central station, by identifying failed part in the ring network, switches paths so as to bypass that identified failed part.

9. A method of detecting failure of a ring network wherein communications are conducted by connecting a plurality of nodes in double loops consisting of a first transmission line and a second transmission line having mutually different transmission directions, and establishing paths on those transmission lines, characterized in that

one of the nodes among the plurality of nodes is established as a central station and other nodes are established as remote stations;

the central station transmits failure monitoring information to respective remote stations using the first and second transmission lines;

the remote stations, upon receiving the failure monitoring information through the first transmission line, loop back and return the received failure monitoring information to the central station using the second transmission line, and, upon receiving the failure monitoring information through the

second transmission line, loop back and return the received failure monitoring information to the central station using the first transmission line; and

the central station identifies a failed part in the ring network based on whether or not the failure monitoring information from each of the remote stations has been received correctly.

10. A method of detecting failure of a ring network wherein communications are conducted by connecting a plurality of nodes in double loops consisting of a first transmission line and a second transmission line having mutually different transmission directions, and establishing paths on those transmission lines, characterized in that

the nodes transmit failure monitoring information to neighboring nodes using the first transmission line or the second transmission line;

the neighboring nodes which have received the failure monitoring information loop back and return the failure monitoring information to the nodes that transmitted the failure monitoring information; and

the nodes that have received the failure monitoring information detect individual failures based on whether or not the failure monitoring information has been received correctly from the neighboring nodes.

11. A system for detecting failure of a ring network wherein communications are conducted by connecting a plurality of nodes in double loops consisting of a first transmission line and a second transmission line having mutually different transmission directions, and establishing paths on those transmission lines, characterized in that

one of the nodes among the plurality of nodes is established as a central station and other nodes are established as remote stations,

the central station comprises:

failure monitoring information means for transmitting failure monitoring information to the remote stations, respectively, using the first transmission line; and

failed part identification means for identifying failed parts in the ring network based on whether or not the failure monitoring information has been correctly received from the remote stations, and

the remote stations comprise:

failure monitoring information return means for looping back and returning the received failure monitoring information to the central station using the second transmission line when the failure monitoring information has been received by the first transmission line.

12. The system for detecting failure of a ring network according to claim 11, characterized in that the first transmission line is used as a primary transmission line for communications between the nodes, and the second transmission line is used as a secondary transmission line for communications between the nodes.

13. The system for detecting failure of a ring network according to claim 11, characterized in that the nodes are arranged in a plurality of dispersed sites, and respectively accommodate one or a plurality of local communication terminals.

14. The system for detecting failure of a ring network according to claim 11, characterized in that the nodes have ATM switches respectively, the failure monitoring information consists of a fixed-length ATM cell, and

transmitting and returning of the failure monitoring information are performed by establishing paths through the ATM switches.

15. The system for detecting failure of a ring network according to claim 11, characterized in that the failure monitoring information is transmitted periodically from the central station to the remote stations.

16. The system for detecting failure of a ring network according to claim 11, characterized in that the failure monitoring information means transmits the failure monitoring information using both the first transmission line and the second transmission line, and the failure monitoring information return means loops back and returns the received failure monitoring information back to the central station using the second transmission line when the failure monitoring information has been received from the first transmission line, and loops back and returns the received failure monitoring information back to the central station using the first transmission line when the failure monitoring information has been received from the second transmission line.

17. The system for detecting failure of a ring network according to claim 11, characterized in that

the remote stations further comprise:

individual failure monitoring information transmitting means for transmitting failure monitoring information individually to other remote stations neighboring those remote stations or to the central station using the first transmission line or the second transmission line; and

failure detection means for detecting failures based on whether or not that failure monitoring information has been correctly received from the neighboring remote stations or central station, and

the neighboring remote stations or central station further comprises:

individual failure monitoring information return means for returning the failure monitoring information so received back to the remote stations that transmitted the failure monitoring information.

18. The system for detecting failure of a ring network according to claim 11, characterized in that the central station further comprises communication restoration means for restoring communications by performing automatic path switching so that failed parts in the ring network identified by the failed part identification means are bypassed.

19. A system for detecting failure of a ring network wherein ions are conducted by connecting a plurality of nodes in double loops consisting of a first transmission line and a second transmission line having mutually different transmission directions, and establishing paths on those transmission lines, characterized in that

one of the nodes among the plurality of nodes is established as a central station and other nodes are established as remote stations,

the central station comprises:

failure monitoring information transmitting means for transmitting failure monitoring information to the remote stations, respectively, using the first transmission line and the second transmission line; and

failed part identification means for identifying failed parts in the ring network based on whether or not the failure monitoring information has been correctly received from the remote stations, and

the remote stations comprise:

failure monitoring information return means for looping back and returning the received failure monitoring information to the central station using the second transmission line when the failure monitoring information has been received from the first transmission line, and looping back and returning the received failure monitoring information to the central station using the first transmission line when that information has been received from the second transmission line.

20. A system for detecting failure of a ring network wherein communications are conducted by connecting a plurality of nodes in double loops consisting of a first transmission line and a second transmission line having mutually different transmission directions, and establishing paths on those transmission lines, characterized in that

the nodes respectively comprise:

failure monitoring information transmitting means for transmitting failure monitoring information to neighboring other nodes using the first transmission line or the second transmission line;

failure monitoring information return means for looping back and returning the received failure monitoring information to those other nodes, when the failure monitoring information has been received from the other nodes; and

